

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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ART UNIT: 4177

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EXAMINER: Stuart, C. W.

TITLE: DEVICE AND METHOD FOR TEMPERING AND HUMIDIFYING GAS,
ESPECIALLY RESPIRATORY AIR

Amendment A: REMARKS

Upon entry of the present amendments, previous Claims 1 - 10 have been canceled and new Claims 11 - 20 substituted therefor. Reconsideration of the rejections, in light of the forgoing amendments and present remarks, is respectfully requested. The present amendments have been entered for the purpose of distinguishing the present invention from the prior art and for the purpose of placing the claim language into a more proper U.S. format.

In the Office Action, it was indicated that Claims 1, 2, 4, 5 and 8 – 10 were now rejected under 35 U.S.C. § 102(b) as anticipated by the Smith patent. Claim 3 was rejected as being obvious over the Smith patent in view of the Anthony patent. Claims 6 and 7 were rejected as being obvious over the Smith in view of the Hitzler patent. There were also formality objections under 35 U.S.C. § 112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

As an overview to the present reply, Applicant has revised original independent Claims 1 and 8 in the form of new independent Claims 11 and 18. New independent Claim 11 and 18 express the limitations in a more proper U.S. format, including proper antecedent bases and proper structural interrelationships throughout. Any indefinite terminology found in the original claim language has

been corrected herein. Additionally, where functional recitations are found, proper “means-plus-function” terminology is incorporated herein. Dependent Claims 12 – 17 correspond, respectively, to the limitations found in previous dependent Claims 2 – 7. New dependent Claims 19 and 20 correspond, respectively, to the limitations found in previous dependent Claims 9 and 10.

With respect to the anticipation rejections based upon the Smith patent, Applicant notes that the Smith patent provides a pump 20. This pump 20 is comparable to the originally-stated “drive device”. However, it should be noted that the pump in the Smith patent only moves fluid into the gas while the drive device of the present invention moves the fluid through the gas. As such, in the end, there is a fluid that actually leaves the gas.

So as to properly distinguish this feature from the prior art Smith patent, it is now stated that the “drive means” is now “a circulating driving means”. This circulating driving means is cooperative with the fluid reservoir and with the humidification chamber for passing the fluid reservoir through a gas in the humidification chamber and also for “passing the fluid from the humidification chamber back to the fluid reservoir”. This feature is clearly not shown in the Smith patent. As such, independent Claim 11 is not anticipated by this prior art reference.

Additionally, in the Smith patent, the controlled heater device does not heat the fluid but, instead, heats the gas/nebulized fluid mixture. The heating of the gas/nebulized or evaporated fluid mixture has the disadvantage that this mixture can be easily overheated. Any overheating of the gas would be harmful to a patient. Additionally, it is very difficult to heat a gas in a proper way in order to avoid overheating the gas. In contrast, since the present invention heats the fluid to a predetermined temperature, it is relatively easy to control the temperature of the gas while, at the same time, ensuring that the gas is not overheated.

Fundamentally, the Smith patent teaches a pressure-type nebulizer. The problems with such a pressure-type nebulizer of the prior art was described in paragraph [0030] of the original specification as follows:

Those devices nebulize a fluid resulting in the formation of tiny droplets, not molecular fluid. Thus those devices inherit the same disadvantages as ultrasound-type nebulizers (see above).

Also, the problems with such ultrasound-type nebulizers were recited in the original specification in paragraph [0028] as follows:

Those devices use ultrasound to induce fluid vibrations resulting in the generation of tiny droplets which enter the gas flow. Main disadvantage of that design is that the “humidification” doesn’t result in molecular fluid within the gas but in substantially larger fluid particles (generation of an aerosol). In contrast to molecular fluid, those larger particles have the potential to transport pathogens to the patient. There is also the risk that – especially with intermittent or varying gas flow – the amount of humidity is too high or too low.

As such, the system of the present invention avoids this problem by heating the fluid to a desired temperature and then, through a heat exchange relationship, passing that temperature to the gas. Since the gas is flowing through the heated fluid, the gas is properly saturated with the fluid at a molecular level. There is no aerosol or droplets formed within the pressurized gas. As such, the present invention overcomes those problems of the prior art.

Relative to the prior art Anthony patent, Applicant notes that the fluid is not heated in a controlled way. The fluid is to be evaporated for humidification. The flow of gas is heated instead of the fluid used for humidifying the gases. This is the same disadvantages as recited hereinabove.

In the Anthony patent, the gas is heated in tube 8'. The fluid is then added to a chamber 7. The energy to evaporate this fluid into the gas has to be drawn from the gas. Accordingly, the gas

is cooled down. It is not possible to reheat the flow of the humidified gas to the desired temperature in the relatively short tube 8. In contrast, in the present invention, the process of circulating the fluid allows the material within the humidification chamber to be heated by the fluid being circulated thereover. The energy thus being accumulated in this material can then easily provide the energy need to evaporate any fluid into the gas. The gas is humidified without being cooled down by withdrawing evaporation energy from it. As such, Applicant respectfully contents that the Anthony patent does not show the teachings of the present invention.

The combination of Anthony patent and the Smith patent would not teach the present invention. In both of these patents, the energy that is used to evaporate any fluid into gas is taken from the gas. In contrast, the present invention teaches the step of drawing the energy to evaporate a fluid into a gas from the fluid heated in advance as well as recirculating the fluid with reheating. As such, the present invention serves to "replenish" energy used for the evaporation.

In the Hitzler patent, there is no heating of the fluid. Only the air stream is cooled or heated before or after the humidification, respectively. The step of the present invention of providing any energy needed to evaporate fluid by heating the fluid and then moving the fluid through the flow of gas is not shown in the Hitzler reference.

The important differences between the present invention, as claimed herein, relative to the cited references is that the fluid is heated in the present invention. Fluid has a higher specific energy capacity than gas such that deduction of evaporation energy from the fluid effects the temperature of the fluid less than deduction of evaporation energy from a flow of gas would affect the temperature of the flow of gas. Also, by the ability to control the temperature of a heated fluid is much easier than controlling the temperature of a heated gas. In the present invention, the fluid is

circulated/recirculated when moving fluid through the gas flow. As such, Applicant respectfully contends that the present invention, as defined by independent Claims 11 and 18, is not anticipated by the Smith patent or would it be obvious after of view of a combination of the prior art references.

Based upon the foregoing analysis, Applicant contends that independent Claims 11 and 18 are now in proper condition for allowance. Additionally, those claims which are dependent upon these independent claims should also be in condition for allowance. Reconsideration of the rejections and allowance of the claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

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